WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2003KS33B

Title: A Field Assessment of a Method for Estimation of Ground-Water Consumption By Phreatophytes: Methodology Refinement and Extension to Areas of Salt-Cedar Infestation

Project Type: Research

Focus Categories: Groundwater, Water Use

Keywords: phreatophytes, ground water, evapotranspiration

Start Date: 03/01/2005

End Date: 02/28/2006

Federal Funds: $8,450

Non-Federal Matching Funds: $17,225

Congressional District: 2nd District

Principal Investigators:
James J. Butler
Kansas Geological Survey

Gerard J. Kluitenberg

Abstract

Low streamflows are an increasing problem in Kansas and other areas of the U.S. Stream-aquifer interactions clearly play an important role in the generation and maintenance of these low flows, with ground-water development often being a major factor responsible for the low-flow periods. Ground-water consumption by phreatophytes is thought to be an important component of the hydrologic cycle in riparian corridors in central and western Kansas and could also be a significant contributor to the low streamflows. Recently, partly in response to concerns about water consumption, expensive measures for phreatophyte control have been advocated for stretches of rivers in western Kansas. However, reliable estimates of the magnitude of ground-water consumption by phreatophytes, its impact on stream-aquifer systems, and the water savings that could possibly be gained from control activities have yet to be obtained. There is a critical need to develop methods that will enable the impact of phreatophyte activity on stream-aquifer systems to be quantified. That is the purpose of the research

described here. In this proposal, we outline the third year extension of a research project directed at the development of a practical field method for identifying and quantifying phreatophyte consumption of ground water, and to assess the water savings gained by phreatophyte control. This method will utilize water-table fluctuations as a means of quantifying phreatophyte activity. An approach based on water-table fluctuations has many advantages: 1) it provides direct information on ground-water consumption, which is virtually impossible to quantify using other methods; 2) the water-table variations on which it is based are the integrated response to a highly heterogeneous and difficult-to-characterize group of phreatophyte stresses; 3) the approach is generic in nature and not dependent on any particular mix of phreatophytes; 4) the approach can be readily implemented at a relatively low cost; and 5) the approach is also a convenient means of assessing the impact of phreatophyte control efforts on plant water use. The activities of the third year of this project will be directed at refining promising methodologies for quantitative assessment of phreatophyte activity and utilizing those methods to assess water savings obtained as part of a demonstration of salt-cedar control measures at a new research site along the Cimarron River. This site was recently established with funding from the Kansas Water Office in order to exploit the opportunities presented by the demonstration project. The end product of this research will be a technique of demonstrated effectiveness for both identifying and quantifying phreatophyte activity. Projects aimed at quantifying phreatophyte activity in other river basins in central and western Kansas are expected to follow from this work.